BELLCOMM, INC.
1100 Seventeenth Street, N.W. Washington, D.C. 20036

SUBJECT: A Possible Mariner
Mars Lander Probe
Case 710

DATE: November 13, 1967

FROM: W. B. Thompson

MEMORANDUM FOR FILE

On October 26, 1967, W. B. Thompson and P. L. Chandeysson met with K. Casani, M. Gram, J. Lonborg, and M. Communtzis at JPL to discuss lander probe concepts for Mars. In particular, a working group that included Ames, LRC, GSFC, and JPL carried out a feasibility study earlier this year which led to the conceptual design of a Mars surface impacting lander probe. The study was aimed at a Mariner Mars 1971 mision. Using advanced development funds, JPL has gone ahead with the fabrication and testing of several key elements of the total probe system.

The total weight of the probe system is about 350 lbs., which is well within the weight capability of the Atlas/Centaur launch vehicle. It is configured to be carried on a Mariner '69 class spacecraft in a position currently occupied by the solar panels and high gain antenna. The system is composed of an entry capsule and an impacting lander. The entry capsule makes atmospheric measurements during descent, transmits data to the flyby probe at 500 bits/sec, and is destroyed on impact. The impacting lander is pulled off the entry capsule by a parachute which is deployed at about Mach 1. The lander weighs about 50 lbs., including about 13 lbs. of science. It is a washer-shaped device partially encased in about 7 lbs. of balsa wood impact limiter. The communications and power subsystems are sized to transmit a total of 600 bits directly to earth at the rate of 1 bit/sec. Scientific data on winds, pressure, temperature, water vapor, and low-mass atmospheric constituents would be collected over a diurnal cycle, in addition to initial surface bearing strength measurements.

Examples of components which JPL is developing and testing include sterilizable batteries which will survive a 2500 "g" impact deceleration, the entry capsule areo-shell and heat shield, and a gas chromatograph for atmospheric gas analysis. High "g" load battery cells are just beginning to survive the sterilization heating process. The entry shell is nearly completed and will be sent to Avco to have the heat shield applied

within a couple of months. Critical parts of the gas chromatograph have survived impact testing at several thousand "g's".

JPL expects that an assembled probe system will be put through many of the normal spacecraft tests during the first half of 1968 at about the same time the Mariner 1969 spacecraft are going through a similar but more vigorous test series. JPL has taken the lander probe concept out of the feasibility study stage and into hardware development to shorten the lead time in the event that NASA decides a probe based on this technology should be carried on a planetary mission. The implication is that this probe could be ready for a 1971 Mars flyby mission. JPL also stated that, with an expanded program, the probe could be developed in time for the '69 Mars missions, although problems associated with the integration of the probe and flyby bus would probably rule out this possibility. This indicates that they do feel they understand most of the technological problems involved in the probe development.

W. B. Thompson

1014-WBT-jan W. B. Thompson

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